



VREO UNITY

TECHNICAL MANUAL

Revision	Date	Details	Authorised
V1.0	12/05/2014	Draft	MV
V1.1	29/05/2014	First Release – includes OneView viewer app details and firmware revision extension.	MV
V2.0	29/09/2014	2 nd Release to coincide with new release of OneView version 2.0.0.4	MV

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Vreo Unity : User Manual

DESCRIPTION

The Vreo Unity board is an interface for the SONY FCB-MA130 camera module. It connects the camera to a host PC over USB3.0.

INPUTS

The SONY FCB-MA130 camera module sends video and still image data over a 16bit parallel data bus; in addition it uses line valid (LV) and frame valid (FV) signals and sends an 81MHz pixel clock signal.

To control the various camera settings and functions an I2C bus is used. Both the standard CMOS Parallel Camera interface and the I2C bus are connected via an FFC cable to the Vreo unity board. These signals connect to the USB controller device.

The camera module also supports a MIPI interface as an alternative to sending the video data, this is not used by the Vreo Unity board.

The controller has a DMA (direct memory access) channel from the parallel input bus to the USB block. This allows it to transfer data at a high rate. If for some reason the host PC cannot read the data quickly enough the frame will be lost. This depends on the capacity and load on the host PC USB controller and the host PC processor load.

The maximum video resolution is 1920 x 1080 @ 30fps. For each pixel in each frame there are two bytes of information one for colour and one for brightness. This equates to approximately 1 Gbits/sec. The USB3.0 bus is capable of transferring up to 5Gbit/s. This will be shared across all devices routed through the same host PC USB3.0 controller chip set – it does not mean you can get 5Gbits/sec from each physical port on the PC. Also when you have more than one device on the bus, the total bandwidth will be reduced due to arbitration between the devices. The combination of the FCB-MA130 and the Vreo Unity board has not been evaluated for multiple devices on the same USB3.0 bus.

RECOMMENDED MINIMUM HARDWARE

Windows 7 or Windows 8.x

Intel i5 processor

8GB Ram

UNIVERSAL SERIAL BUS (USB)

The USB is configured to use Endpoint 0 as a control channel. Endpoint 1 is configured as a bulk transfer for video. The bulk transfer is sent in 1024 byte packets each with a 12 byte UVC header. The UVC header is used to indicate the start of frame and end of frame data and it also toggles a bit between packets. It also indicates if the data is from a still image or from a video frame. The format of the UVC header is defined in the UVC version 1.5 documentation.

The firmware on the Unity Board contains all the USB descriptors. When first connected to the USB there is a negotiation phase between the host PC and the Unity board. In this phase the descriptors are used to tell the host PC what the capabilities of the device are. What resolutions it supports and what controls it supports.

The communication between the devices uses a small number of control requests. INFO, Length, GET, SET, Default, Max and Min. Using these requests the driver on the host PC can determine the maximum and minimum values for the control, what the default value is, if it can get the value of the control as well as set the value, it can also determine the length of any data that needs to be sent between the devices. This communication is handled by generic windows drivers.

UNIVERSAL VIDEO CLASS (UVC)

Universal Video Class (UVC) is a specific class of products for USB, just like a computer mouse is a Human Interface Device or HID. A UVC device handles video data and common camera controls in a defined way. It is defined in the UVC standard. The Vreo Unity implements this standard in firmware and as such it is possible to view and control the camera from a number of host PC programs. However not all functions of the FCB-MA130 are standard UVC commands. Face detection and image stabilisation for instance are not covered in the UVC standard. For non-standard controls, extension units (see below) are used.

USB3.0 / USB2.0

USB3.0 allows for increased bandwidths of data transmission. It can support 5 Gbits/sec whereas USB2.0 only supports 480 Mbits/sec. USB3.0 enables the use of high resolution video cameras over USB. It is possible to use the Vreo Unity board with a USB2.0 connection. In this case only 680 x 420 resolution at 15 fps is supported.

EXTENSION UNITS

To allow for non-standard controls UVC provides the extension unit. This allows a device to describe what additional controls it has and how they work. This is done using descriptors in the firmware which state how many extension controls there are. When the device is connected there is a negotiation stage where the low level drivers for the OS will query these extension unit controls and find out the min, max and default values along with the size of data expected to be passed between the device and the PC. A host PC application that is aware of what these controls are can use these additional controls. Please see the Extension Unit details in APPENDIX 2.

APPLICATION PROGRAMMING

Both the directshow api and the .net framework provide functions that expose the various pins of the device and allow you to write a custom application to control the camera and view the streaming video or image data. The low level driver handles USB endpoints and enumeration/negotiation.

To access the extension units you can use the Microsoft COM interface and the IksControl methods.

For further background information especially for those wanting to develop their own host software the following documents and resources are recommended.

USB Serial Bus Specification 3.1 : Available from USB.org

UVC 1.5 Class Specification : Available from USB.org

SONY: FCB Micro - Application Note

SONY: FCB Micro User Interface Command / Event Specifications

SONY: FCB Micro User Interface Supplementary Registers Specification

MSDN see section USB Video Class Driver.

Vreo now supply an API and source code for Visual Studio 2013. There are two VS project solutions. One is for the OneView viewer application and one is for a reduced functionality OneViewLite viewer. These projects show how to access the UVC and extension controls and can be used to develop your own end user applications or integrate into existing software. They are intended for development by those wishing to design in the Vreo Unity PCB into their own end user products.

OneView VIEWER APPLICATION

To demonstrate the Vreo Unity board we supply the OneView Application. This has implemented the standard UVC controls. All the extension unit controls and a video record function.

To install the viewer run the setup.exe file. This should be supplied either on a USB stick or via email.

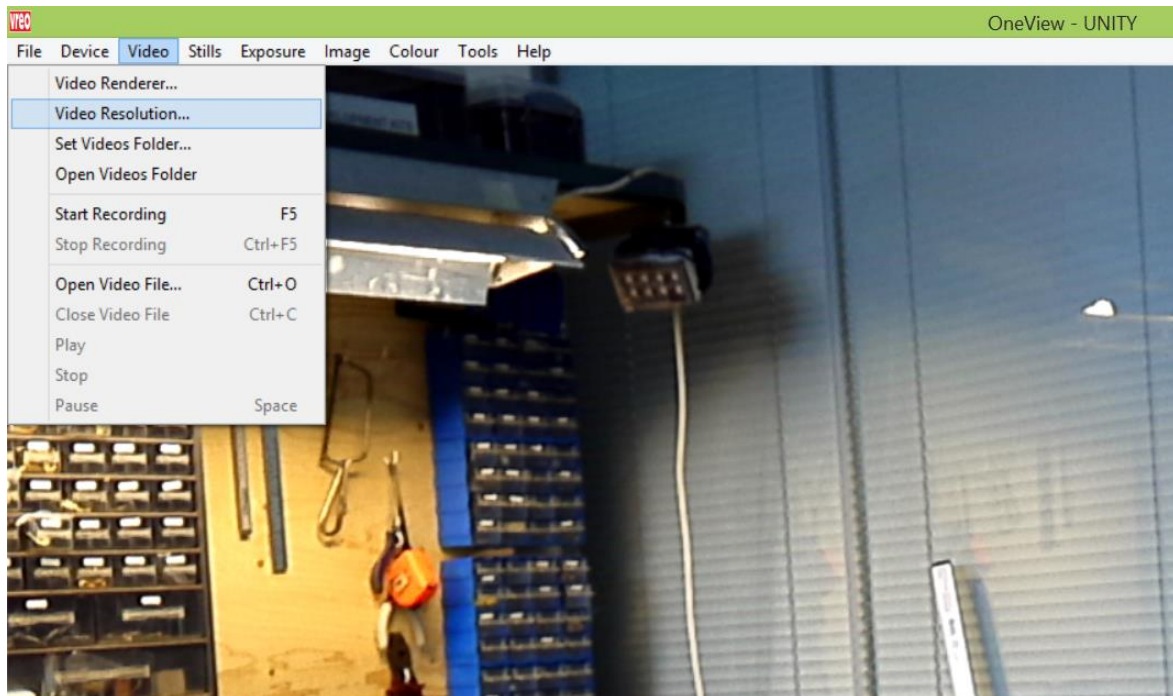
Make sure that your computer is connected to the internet, if necessary it will install the generic windows driver from the internet.

Plug in the Vreo Unity / FCB MA130 into a USB3.0 port.

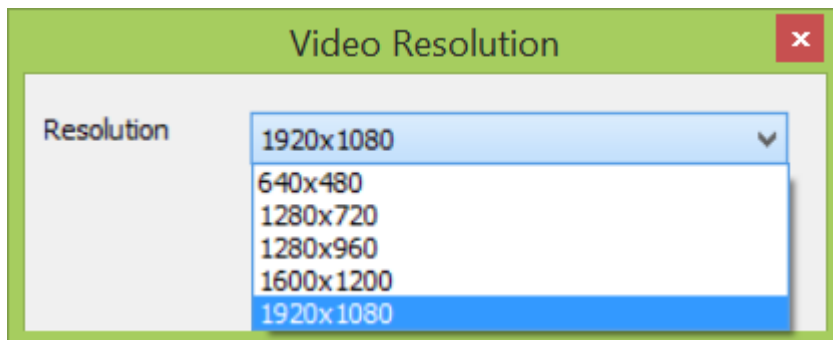
Run the OneView application and then select Devices -> Unity.



You should then see streaming video at 640 x 480 at 30fps as indicated in the bottom of the window.

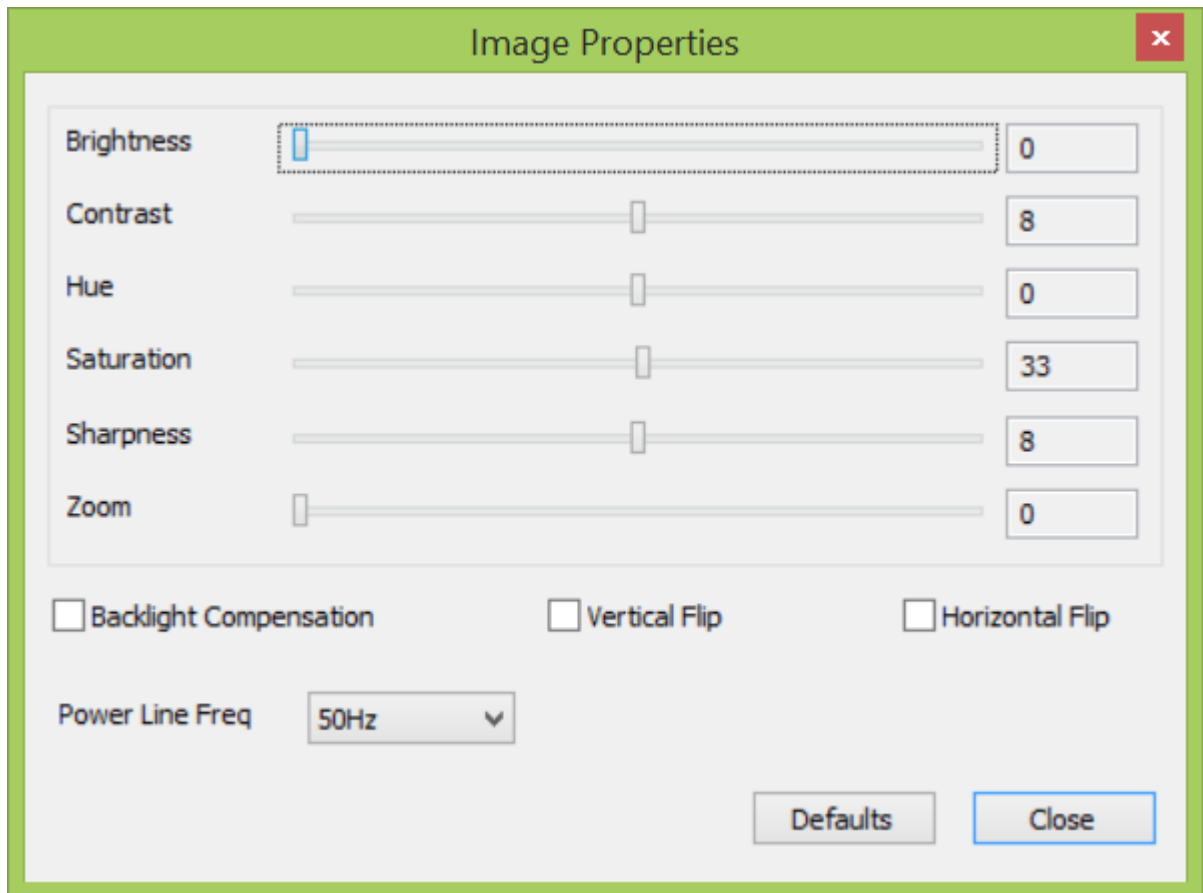


To change the video resolution select Video -> Video Resolution -> then select from the drop down menu as shown :



You should then change back to the streaming video view and see the newly selected resolution.

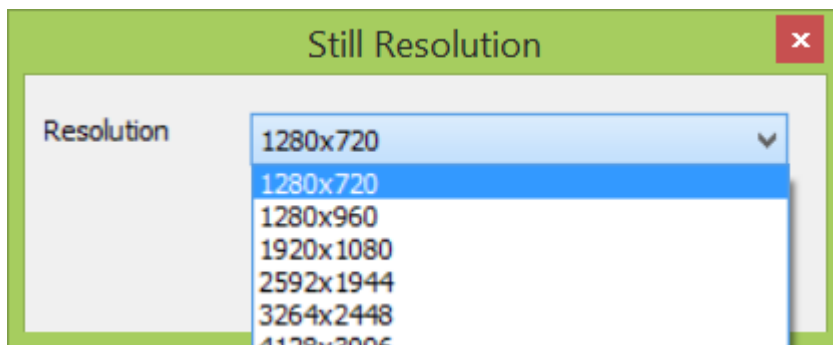
To use the standard UVC image settings such as brightness, hue and saturation select Image -> and adjust the slider settings.



Vertical Flip and Horizontal flip are accessible from this window also (they are implemented as extension controls). This image manipulation is done inside the FCB-MA130 camera and does not add additional load to the host PC processing.

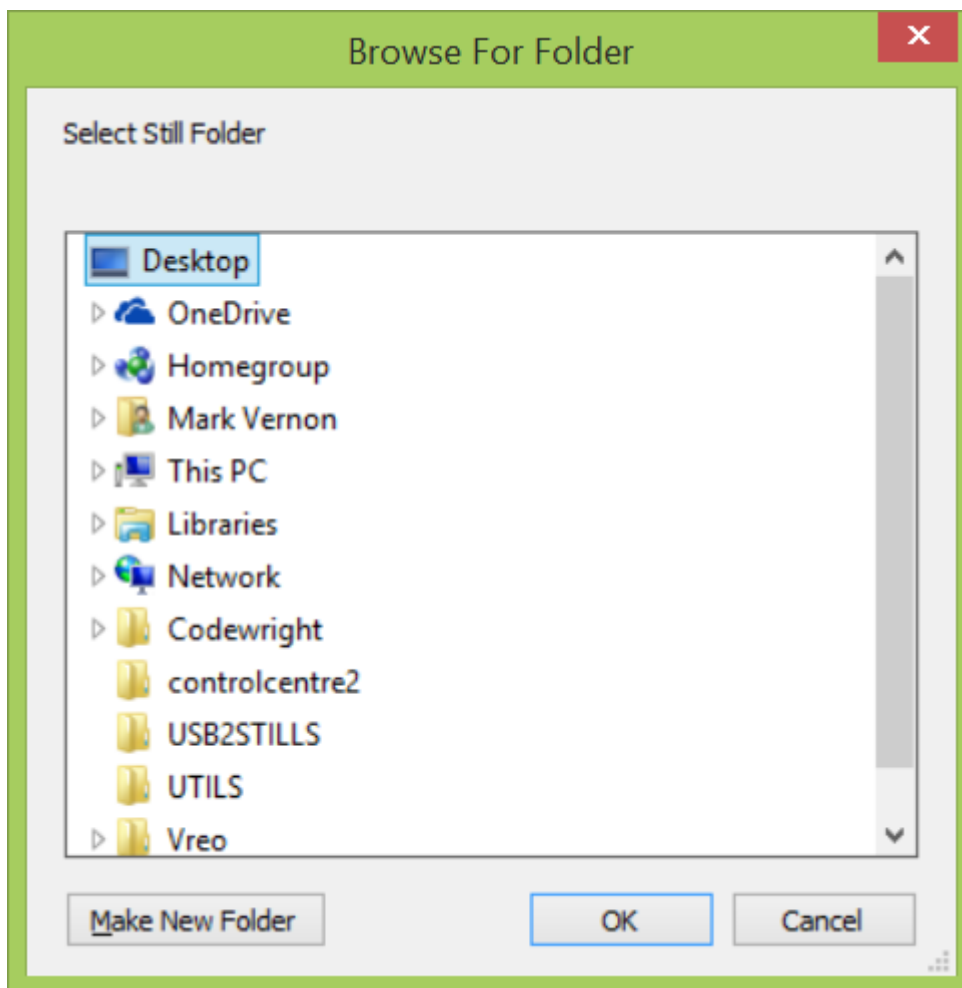
For Still Images :

To set the resolution: Stills -> Still Resolution then select from the drop down menu:



Click OK.

To set the path for saving the still images select Stills -> Set Still Folder



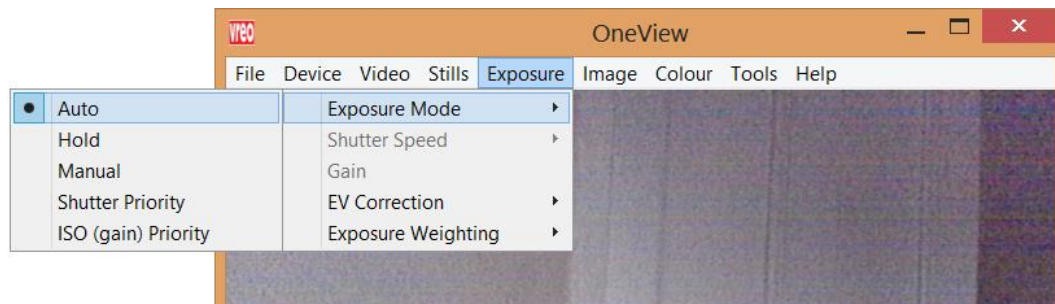
Browse to the required location and click OK.

To take a still image select Stills -> Get Still(Enter)

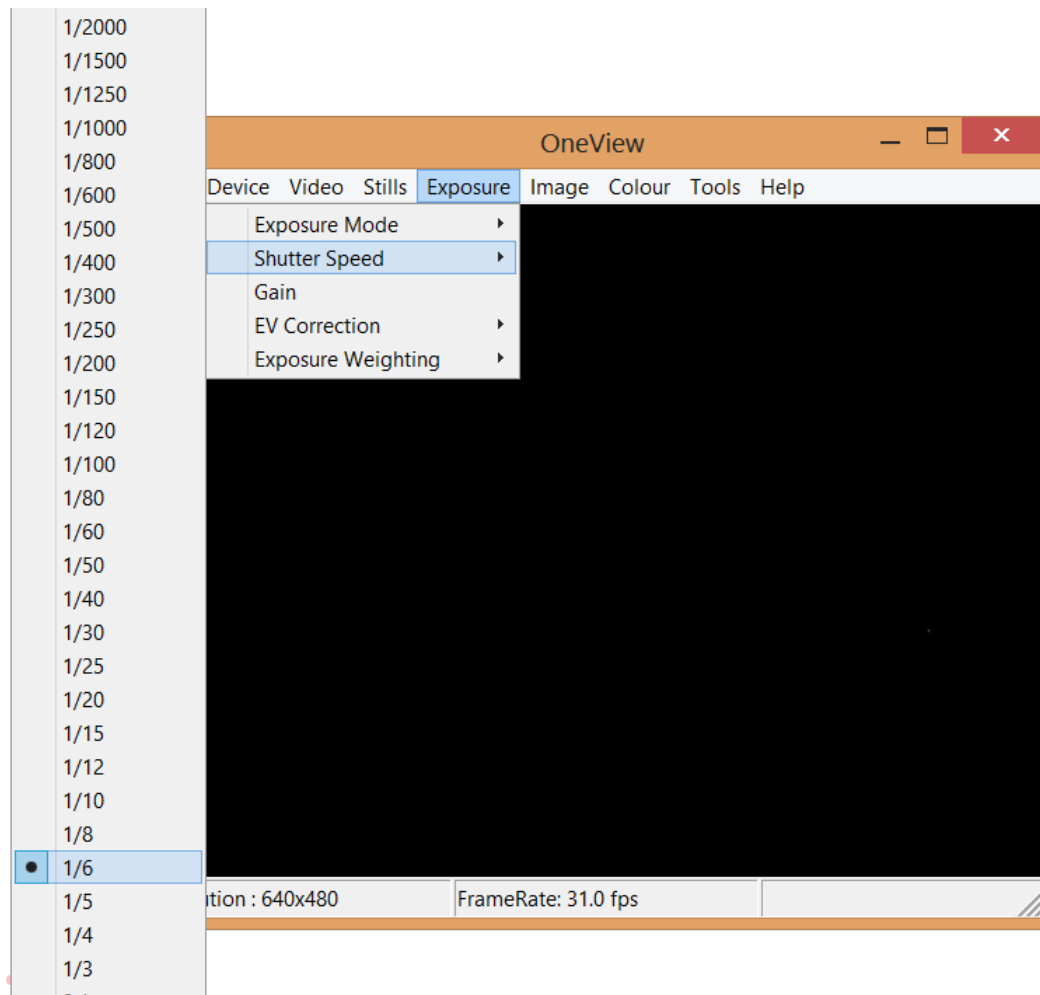


The following functions are all implemented as extension units.

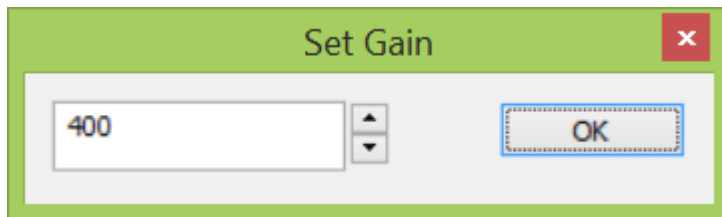
Exposure mode : To set the required exposure mode select Exposure -> Exposure Mode and then select the desired mode. When you select Manual or Shutter Priority then Shutter Speed controls will be accessible in the previous menu. If you select Manual or ISO (gain) Priority then Gain controls will be enabled in the previous menu.



Setting the shutter speed in manual exposure mode.

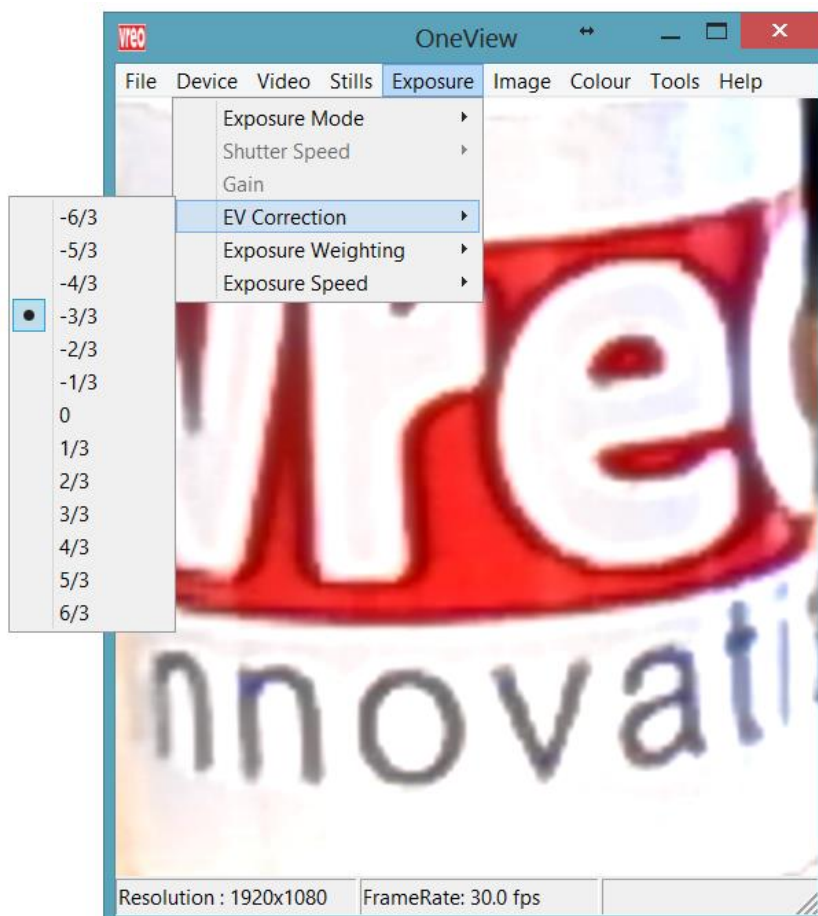


Setting the gain in manual exposure mode :



Use the arrow keys or text box to enter a new gain and select OK.

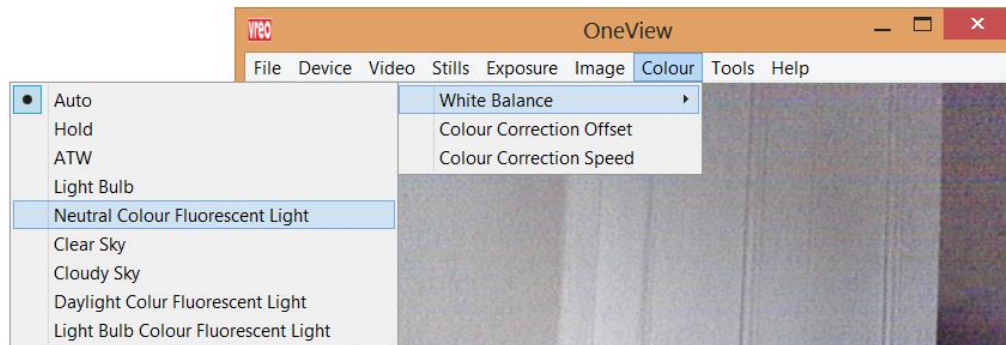
To set the EV correction select Exposure -> EV Correction



Similarly to set the exposure weighting to either centre weighted, average or spot: Select Exposure -> Exposure weighting. Note that depending on what it is in the scene you may see little effect from changing this setting. Especially when changing between centre weighting and average weighting.

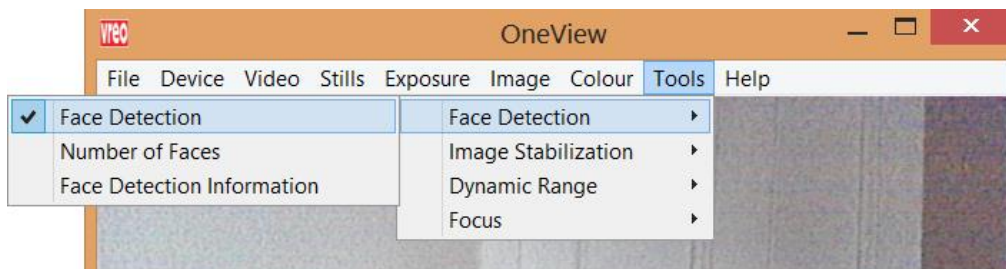
Colour Controls

The white balance mode can be set by selecting Colour -> White Balance



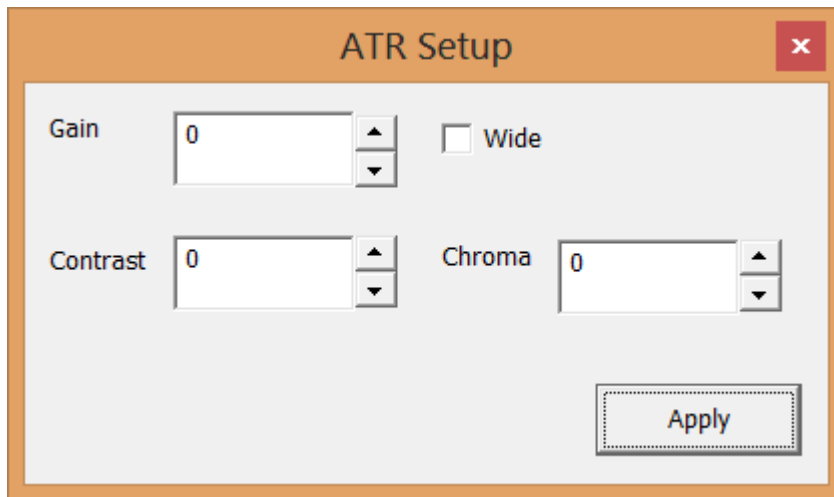
Tools :

Face detection the max number of faces that will be detected and the face detection information can all be selected via the Tools -> Face Detection Menu.



Adaptive gradation and ATR setup can be selected from Tools -> Dynamic Range.

ATR Setup allows you to adjust the ATR settings of ATR Gain, ATR Contrast and ATR Chroma.



Focus

You can perform a one touch autofocus action from Tools -> Focus -> AutoFocus or you can adjust the focus manually using Tools -> Focus –Manual Focus and then selecting from the options shown below.

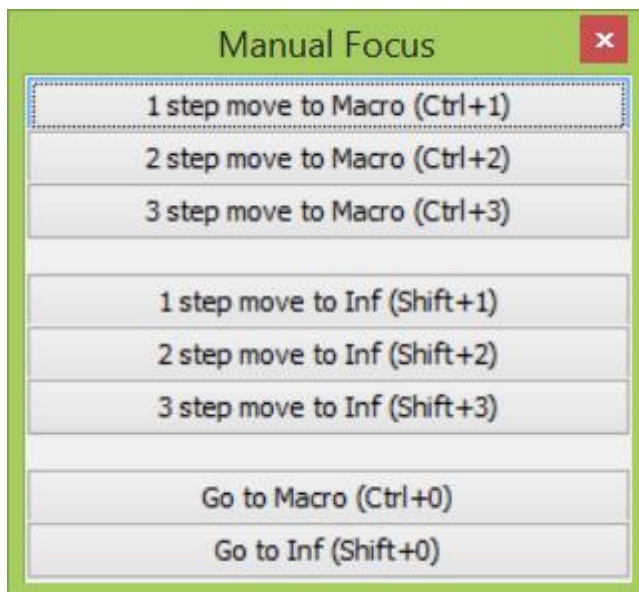
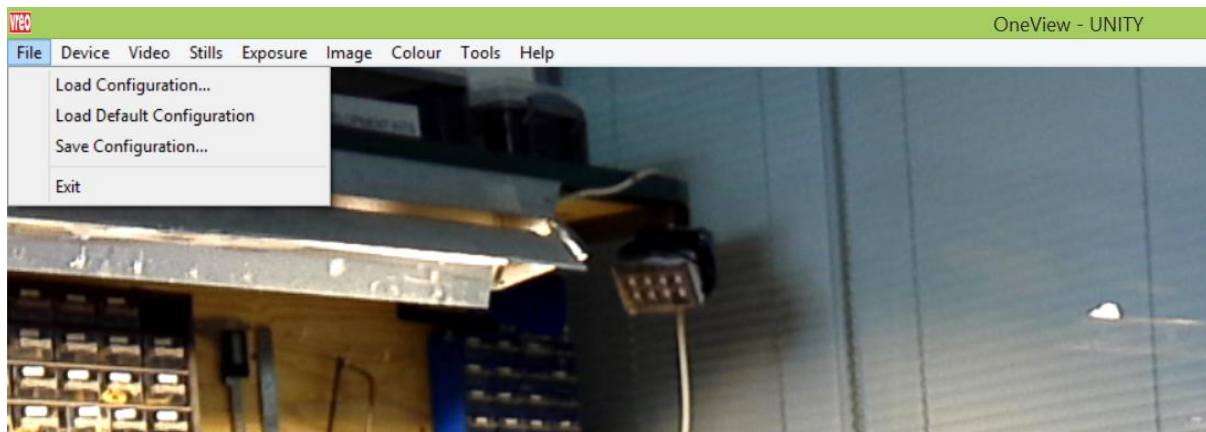


Image stabilisation can be enabled from the Tools menu also.

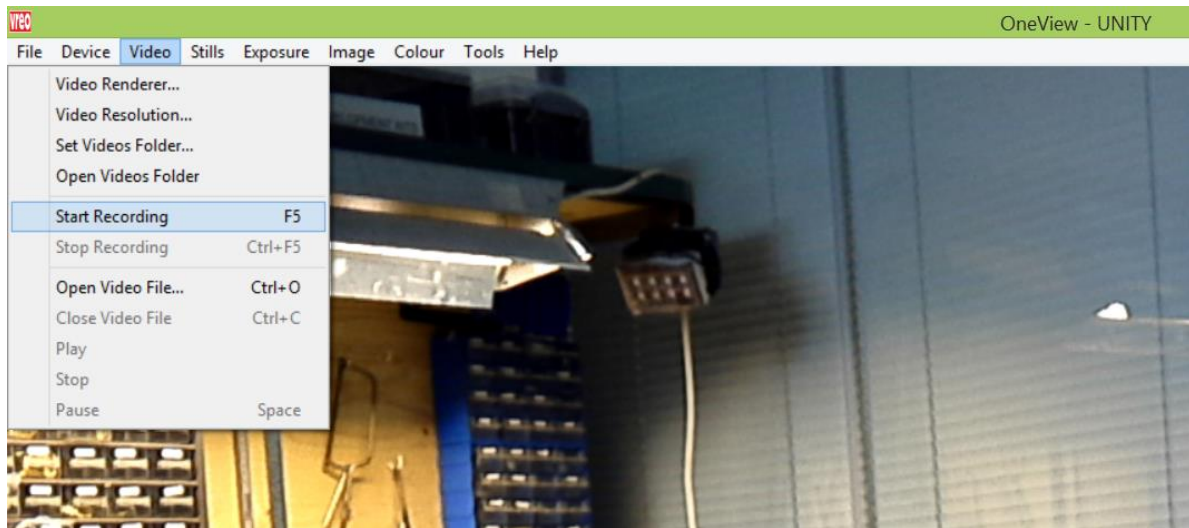
If you select Help -> About you can also see the firmware revision installed on the Unity board and the revision of the OneView GUI.



On startup OneView will set the camera to the last used settings. It does this using configuration files. You can set the camera to a new configuration and save this configuration to a specific filename using File -> Save Configuration. You can load a named configuration at a later date using File -> Load Configuration. You can also load the default configuration to get back to factory default settings.



You can record and playback video in an AVI format from the Video menu.



USB2.0 Functionality

Most functions are also available when connected to a USB2.0 port. However due to the limited bandwidth of USB2.0 only 640x480 resolution video at 15fps is enabled. Also still image capture is currently limited to 1920 x 1080 resolution.

DRIVERS

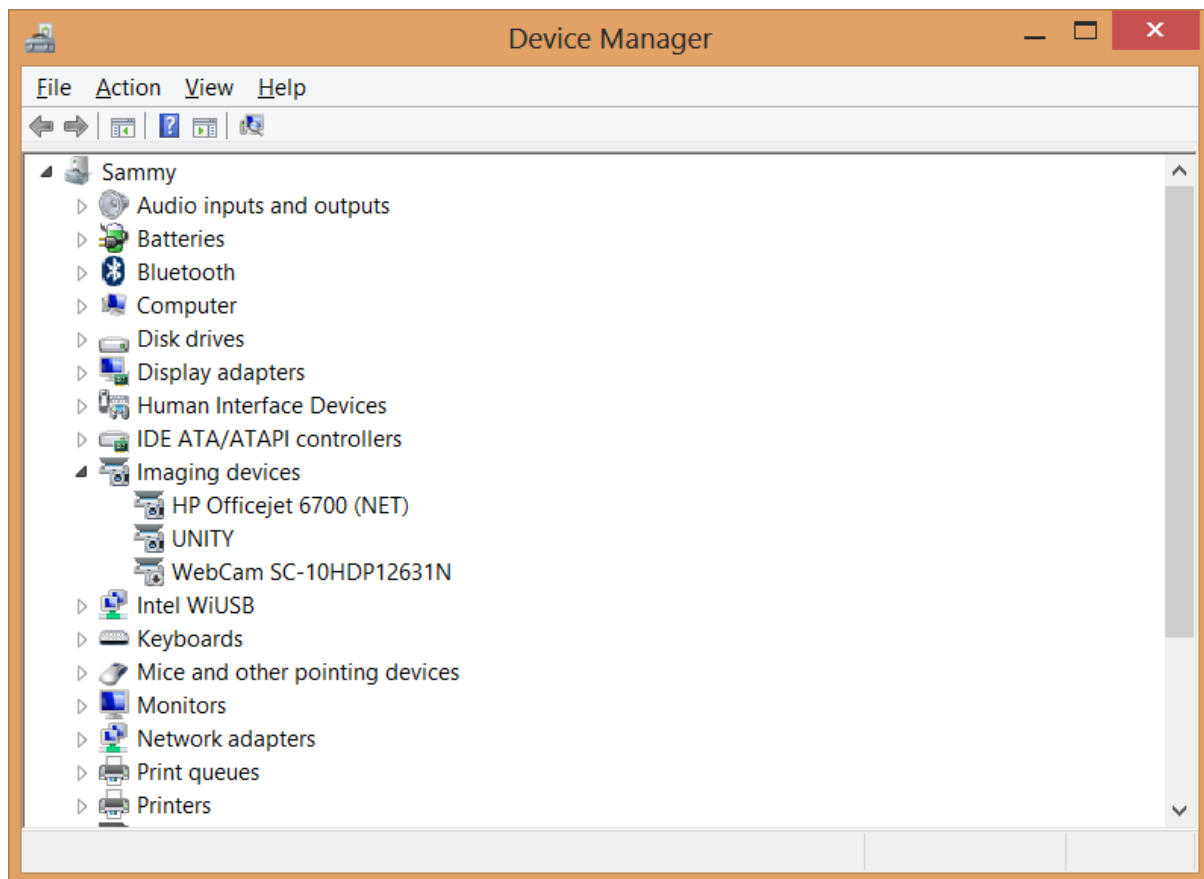
As the device uses the established UVC standard it does not require a custom driver and a windows generic USB driver can be used. It may need to be installed when you first connect the device – windows will search for the appropriate driver on line.

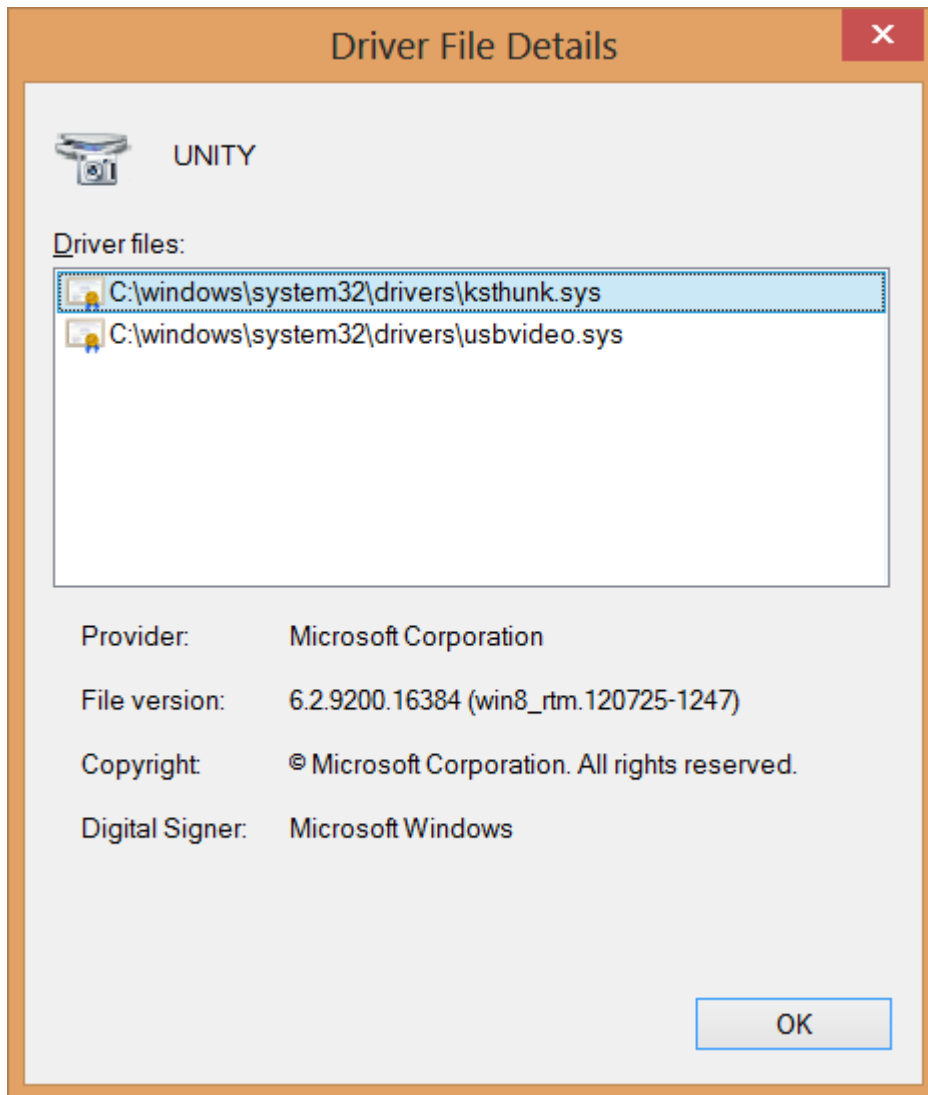
The device should connect as an imaging device in device manager with the following drivers.

c:\windows\system32\drivers\ksthunk.sys

c:\windows\system32\drivers\usbvideo.sys

You can check that this is the case in device manager -> imaging devices -> UNITY -> driver details





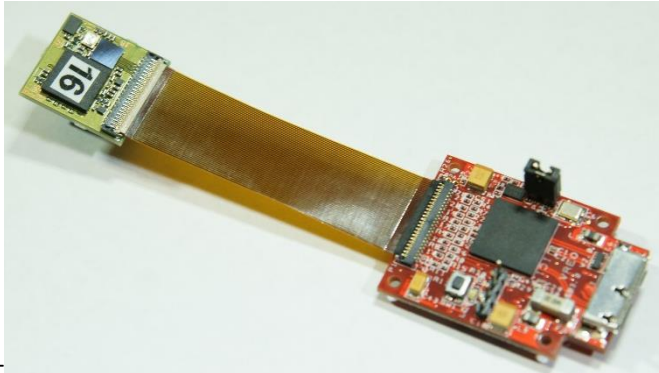
VENDOR IDENTIFICATION (VID)

Vreo supplies the Unity board with its own Vendor Identification number (VID) and product identification number (PID). This means that when it connects to the PC it should be recognised as a Vreo product. It is possible for larger volumes for Vreo to supply with a custom VID and PID. There is a one off fee to arrange this. You must also already have your own VID assigned by USB.org. Contact your distributor for more details.

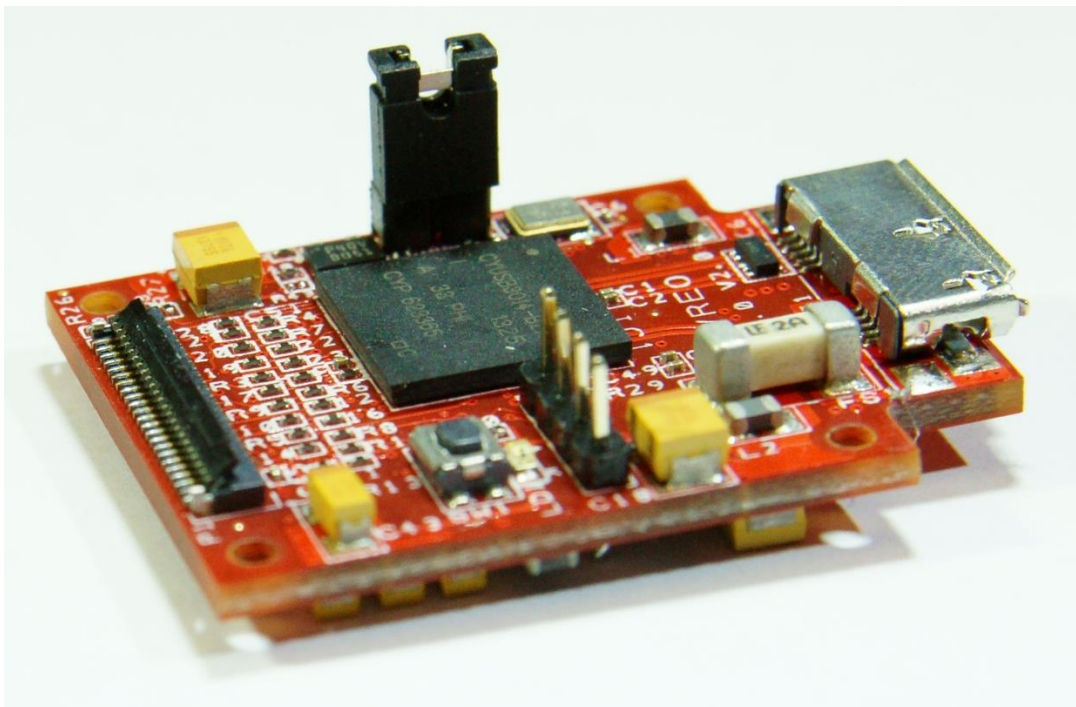
CABLES

There is a 45 way 0.3mm pitch FFC Jumper cable required between the camera module and the Vreo Unity board. This cable should have a single ended impedance @100MHz.

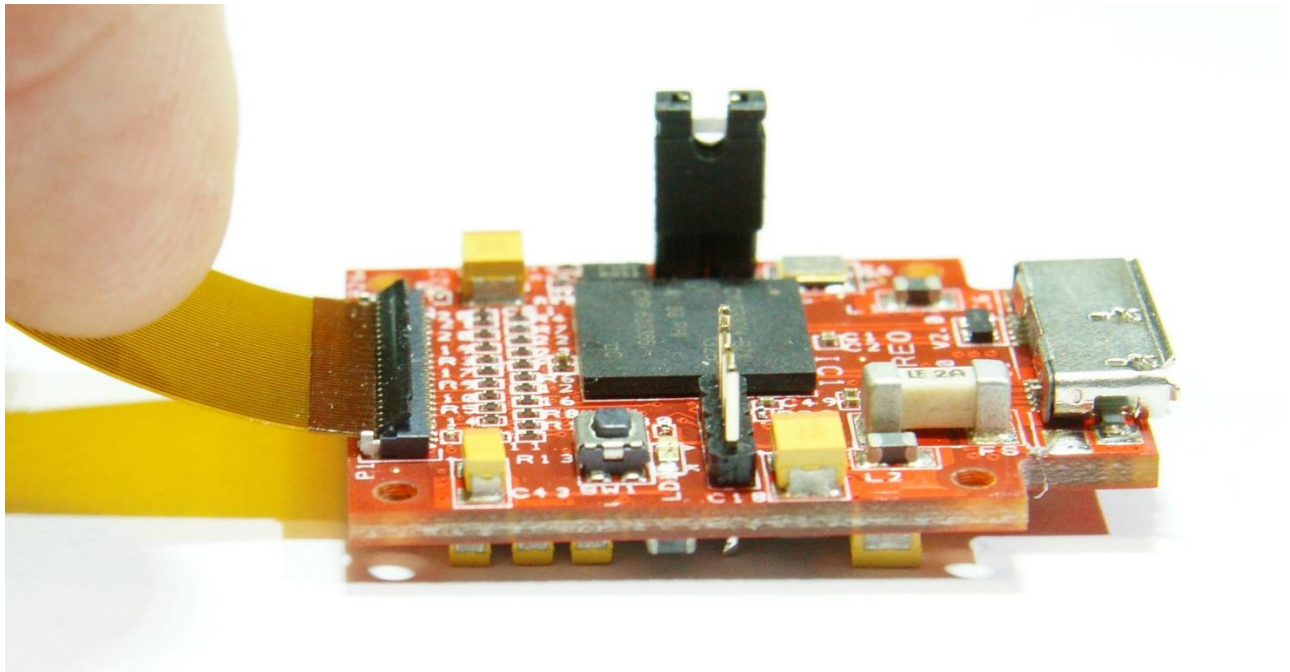
The exposed gold contacts at the ends of the cable should be face down when inserted into the connectors of the Vreo Unity board and the SONY FCB-MA130 camera modules:



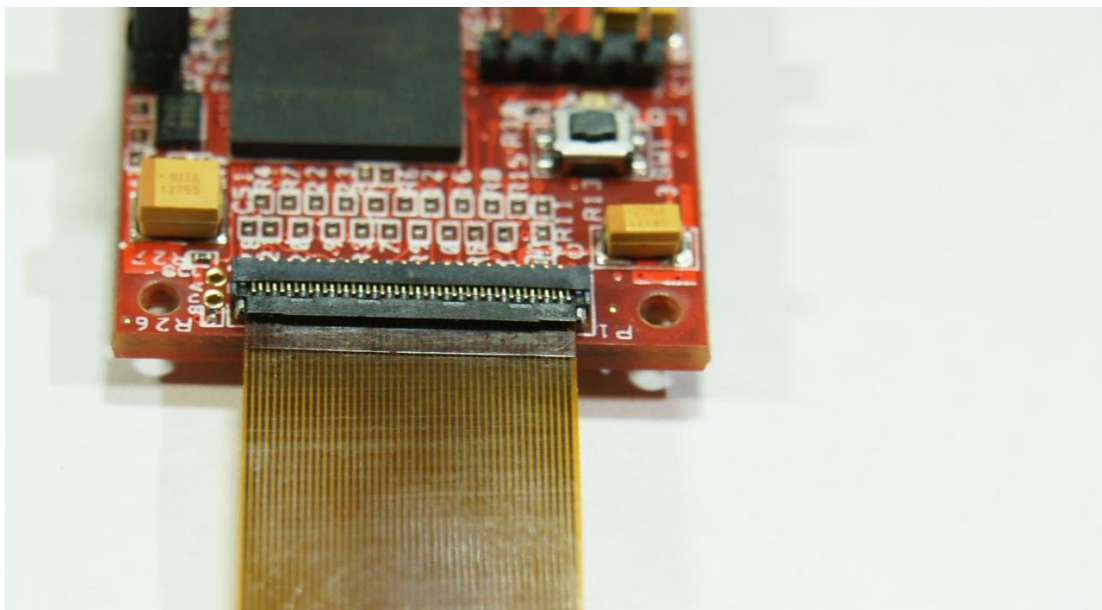
To connect the FFC cable to the Vreo Unity board lift the flap of P1 the FFC connector as shown below:



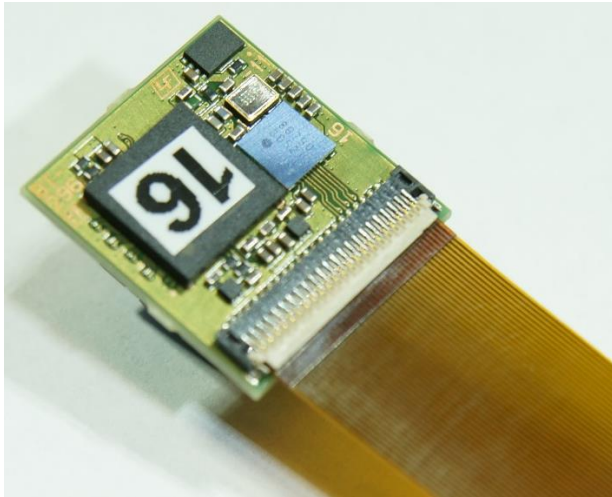
Insert one end of the cable into the connector, the exposed gold contacts of the cable need to point down towards the PCB.



Make sure that the cable is square on to the connector and seated in a definite position inside the connector; then flip down the latch.



In a similar manner connect the other end to the SONY FCB-MA130 camera module, make sure the exposed contacts face down towards the PCB.



WARNING

These types of connectors are not designed for many cycles of insertion and removal. It is best to fit these and not remove them.

WARNING

Do not touch the exposed gold contacts on the cable or the contacts of the connector. This can lead to longer term reliability issues if grease and dirt contaminate these surfaces.

A USB3.0 cable is required to connect the Vreo Unity board to the host PC.

USB3.0 Type A male connector to USB3.0 Micro-B male plug is required.

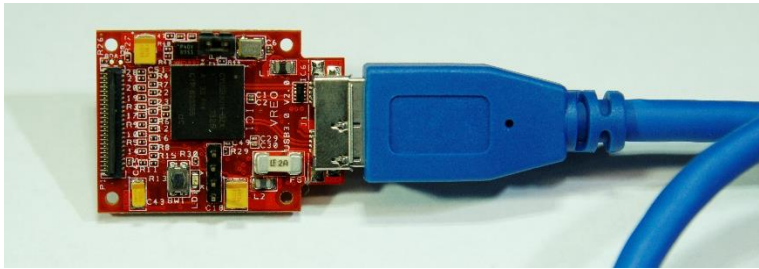


Figure 1 - USB3.0 Type A Male Connector



Figure 2 - USB3.0 Micro B Male Plug

Connect the Micro B end to the Vreo Unity board:



The Type A connector should be connected to a USB3.0 port on the host PC.



Figure 3 - USB3.0 Connectors on Host PC

MOUNTING

To mount the Vreo Unity board you can use the four mounting holes with 1.6mm threaded machine screws with a 2.8mm head size. Such as BIVAR 739.

A minimum of 4mm height spacers should be used with an outside diameter of less than 3.5mm and an internal diameter to match the screw.

One such spacer is 937-4MM from BIVAR. It is available from Mouser part number 749-936-4MM.

WARNING

Do not screw the board down without using spacers, do not rely on the PCB components to offset the board.

WARNING

Make sure the board is screwed down equally – i.e. do not subject the PCB to twisting or bending forces.

Vreo makes no claim to the suitability of the mounting method to your specific application or vibration requirements.

To mount the camera please refer to the SONY technical information. There are a lot of elements to how it is mounted. For further information and queries regarding mounting of the camera please seek assistance from your SONY distributor.

WARNING

The camera must have some heat dissipation plate. It can be tempting to run the camera without such a plate but after it has warmed up, reliability can be compromised and frame rates may drop.

POWER

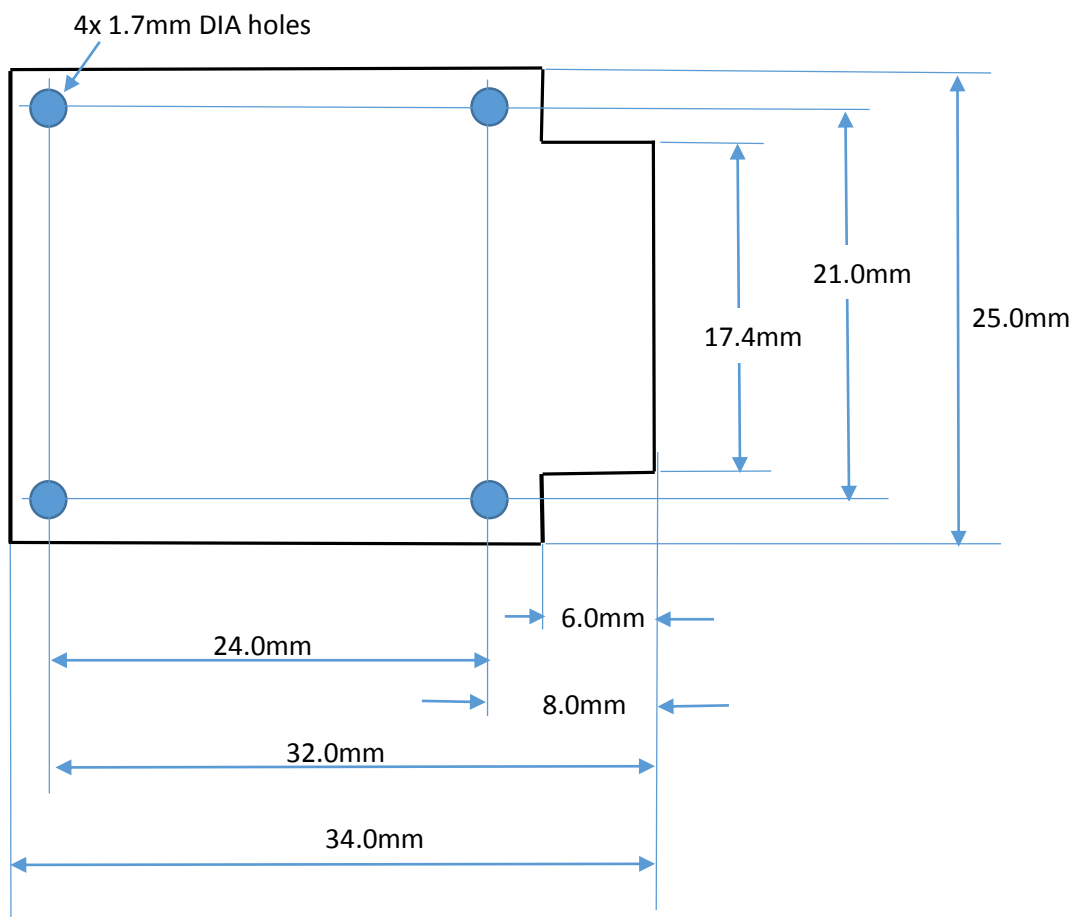
The Vreo interface draws its power from the USB bus. It uses 5 volts and draws a maximum of 500mA. Typical = 300mA.

The board has a 2A fuse as the first element onto the board and is there to protect the host PC in the event of a short circuit or over current situation on the board. In normal operation this should never blow.

TEST HEADER

A 4 pin header for factory test is located on the PCB, this is used to send debug messages over RS232. It is not intended for customer use.

DIMENSIONS



Four 1.7mm mounting holes are provided, these are intended for 1.6mm screws.

There is also a step file for the board that can be used for modelling.

SPECIFICATION

Power	Powered from USB bus Max current = 500mA
Operating Temperature	0 to +50°C
Video Resolution USB3.0 30FPS	Full HD 1920 x 1080 UXGA 1600 x 1200 SXGA 1280 x 960 HD 1280 x 720 VGA 640 x 480
Video Resolution USB2.0 15FPS	VGA 640 x 480
Still Image Capture Resolution USB3.0 Method 2	13M 4192 x 3104 12M 4128 x 3096 8M 3264 x 2448 5M 2592 x 1944 Full HD 1920 x 1080 UXGA 1600 x 1200 SXGA 1280 x 960
Image Stabilisation	ON/OFF applies to video and stills
Exposure Modes	Auto, Hold, Shutter Priority, Gain Priority
Shutter Speed (Shutter Priority Mode)	1/5000, 1/4000, 1/3000, 1/2500, 1/2000, 1/1500, 1/1250, 1/1000, 1/800, 1/600, 1/500, 1/400, 1/300, 1/250, 1/200, 1/150, 1/120, 1/100 1/80, 1/60, 1/50, 1/40, 1/30, 1/25, 1/20
Gain Settings (Gain Priority Mode)	1 to 65535 equivalent to ISO value
EV Correction	-6/3, -5/3, -4/3, -3/3, -2/3, -1/3, 0, 1/3, 2/3, 3/3, 4/3, 5/3, 6/3
Back Light Compensation	ON/OFF
Auto Exposure Weighting	Centre, Spot, Average
Auto Exposure Speed	Sets convergence speed : normal, high, low
White Balance Mode	Auto, Hold, All pull in, Light Bulb, Neutral Fluorescent, Clear Sky, Cloudy Sky, Daylight Fluorescent, Light Bulb Fluorescent
White Balance Offset	ON/OFF, Red Offset, Blue Offset
White Balance Speed	Sets convergence speed : normal, high, low
Flicker	Off, Auto, 50Hz, 60Hz, 50Hz -> Auto, 60Hz -> Auto
Autofocus	Contrast method
Manual focus	Move to the fixed Macro or Infinity positions. Step towards Macro, Step towards infinity, Adjustable Step size
Image Flip	Horizontal and vertical
Brightness	0 to 15

Contrast	-8 to +8
Sharpness	-8 to +8
Hue	-30° to +30°
Color Gain	-32 to +32
Zoom	Digital zoom x1 to x16
Face Detection	On/Off, #faces. Reports X & Y position, size and rotation angle for max 8 faces.
Test chart	On/Off

APPENDIX 1 – Standard UVC Controls

Controls Implemented as standard UVC controls.

Brightness

Sharpness

Hue

Contrast

Flicker

BLC

Zoom

Still capture method 2 is supported.

Video resolution and still capture resolution change are supported.

APPENDIX 2 - Extension Unit Controls

EX_EXPOSURE_MODE			
Extension Unit Control Number		0x01	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	4	Min	0
Default	0	Camera CMD	CM_AE_MODE
<p>This extension unit control is used to change exposure mode. The control expects an unsigned int in the range 0 to 4. It effectively calls the CM_AE_MODE command with the received byte as the parameter.</p> <p>0 = Auto, 1 = Hold, 2 = Manual, 3 = Shutter Priority, 4 = ISO (gain) Priority</p>			

EX_EV_CORRECTION			
Extension Unit Control Number		0x02	
Get	Yes	Length	1
Set	Yes	Type	Signed Int
Max	+6	Min	-6
Default	0	Camera CMD	CM_AE_EV_CORRECTION
<p>This extension unit control is used to change EV Correction level. The control expects a Signed int in the range -6 to +6. -6 equates to -6/3 in real life and each step is 1/3.</p> <p>It effectively calls the CM_AE_EV_CORRECTION command with the received byte as the parameter.</p>			

EX_EXPOSURE_WEIGHTING

Extension Unit Control Number		0x03	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	2	Min	0
Default	0	Camera CMD	CM_AE_PHOTOMETRY

This extension unit sets the exposure weighting or metering.
0 = Centre Weighted, 1 = Spot, 2 = Average Weighting.
It effectively calls CM_AE_PHOTOMETRY with the received byte.

EX_EXPOSURE_SPEED

Extension Unit Control Number		0x04	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	+2	Min	0
Default	0	Camera CMD	CM_AE_SPEED

This extension unit control is used to set the convergence speed of the auto exposure algorithm.
The control expects an unsigned int in the range 0 to +2 .
It effectively calls the CM_AE_SPEED command with the received byte as the parameter.
0 = Normal, 1 = High, 2 = Low

EX_ADAPTIVE_GRADATION

Extension Unit Control Number		0x05	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	1	Min	0
Default	0	Camera CMD	CM_ATR

This extension unit control is used to turn on or off the adaptive gradation correction which can be used to extend the dynamic range of the camera.
It calls CM_ATR camera command.

EX_ATR_SETUP

Extension Unit Control Number		0x06	
Get	Yes	Length	4
Set	Yes	Type	Unsigned Int
Max	255,1,255,255	Min	0,0,0,0
Default	0	Camera CMD	N/A

This extension unit control is used to write all 4 supplementary registers associated with the adaptive gradation correction / wide dynamic range. A 4 byte unsigned integer array is expected.

The register addresses and the relevant parameters written to are :

0x120B ATR_GAIN How much of the ATR effect to apply. 0 - 255
0x120C ATR_WIDE_D 0 = Off, 1 = ON
0x120D ATR_CONTRAST 0 = AUTO, Low = more contrast, High = more WDR
0x120E ATR_CHROMA The higher the number, the higher the chroma.

Using this control only sets the relevant supplementary registers to have any effect you should then use the EX_ADAPTIVE_GRADATION control.

EX_HORIZ_FLIP

Extension Unit Control Number		0x07	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	1	Min	0
Default	0	Camera CMD	CM_PICT_MIRROR

Sets the horizontal image flip on or off.
Applies to both video and still images.
Processing is performed on the camera.
0 = off. 1 = on

EX_VERT_FLIP			
Extension Unit Control Number		0x08	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	1	Min	0
Default	0	Camera CMD	CM_PICT_MIRROR
Sets the vertical image flip on or off. 0 = off. 1 = on			

EX_IMAGE_STABILISATION			
Extension Unit Control Number		0x09	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	1	Min	0
Default	0	Camera CMD	N/A
Sets the image stabilisation on or off. It is applied to both video and still image modes. 0 = off. 1 = on			

EX_SHUTTER_SPEED

Extension Unit Control Number		0x0A	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	38	Min	1
Default	31	Camera CMD	

Sets the supplementary register AE_SHUTTER on the camera.

Only has any effect when you issue a EX_EXPOSURE_MODE with Shutter Priority.

Values 1 to 38 correspond to real world exposures as per the following table.

	Time (sec)		Time (sec)		Time (sec)		Time (sec)
1	1/5000	11	1/500	21	1/50	31	1/5
2	1/4000	12	1/400	22	1/40	32	¼
3	1/3000	13	1/300	23	1/30	33	1/3
4	1/2500	14	1/250	24	1/25	34	0.4
5	1/2000	15	1/200	25	1/20	35	0.5
6	1/1500	16	1/150	26	1/15	36	0.65
7	1/1250	17	1/120	27	1/12	37	0.8
8	1/1000	18	1/100	28	1/10	38	1
9	1/800	19	1/80	29	1/8		
10	1/600	20	1/60	30	1/6		

EX_GAIN

Extension Unit Control Number		0x0B	
Get	Yes	Length	2
Set	Yes	Type	Unsigned Int
Max	65535	Min	1
Default	800	Camera CMD	

Sets the supplementary registers AE_ISO on the camera.

Sets the ISO sensitivity – equivalent to Gain

Only has any effect when you issue EX_EXPOSURE_MODE with ISO Priority.

EX_AUTO_FOCUS			
Extension Unit Control Number		0x0C	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	1	Min	0
Default	0	Camera CMD	N/A
<p>This will action a one touch auto focus sequence. 0 = normal, 1 = perform autofocus. When the operation has finished the firmware will reset this control to 0, i.e. a get operation will return 1 whilst the autofocus operation is happening and 0 when it has finished.</p> <p>This is a one shot action.</p>			

EX_MANUAL_FOCUS			
Extension Unit Control Number		0x0D	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	See below	Min	See below
Default	0	Camera CMD	CM_MANUAL_FOCUS
<p>Bits 7:6 sets the mode 00 = Move to infinity position 01 = Move towards the infinity position 10 = Move to Macro position 11 = Move towards macro position</p> <p>Bits 5:0 set the step size for modes 1 and 3. We will set this to either 1, 2 or 3 in the OneView Application.</p>			

EX_FACE_DETECTION

Extension Unit Control Number		0x0E	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	1	Min	0
Default	0	Camera CMD	CM_FDT_MODE

This enables the face detection function.
0 = off, 1 = on.

EX_NUM_FACES

Extension Unit Control Number		0x0F	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	8	Min	1
Default	8	Camera CMD	

Sets the supplementary register for the number of faces.
Has no effect until face detection is turned on.

EX_FACE_INFO

Extension Unit Control Number		0x10	
Get	Yes	Length	56
Set	No	Type	Unsigned Int
Max		Min	
Default		Camera CMD	

This extension control receives an 56 byte array of data with the face information.

Byte 0 = face 1, Pos X (X position information is 2 bytes long)

Byte 2 = face 2, Pos X

....

Byte 12 = face 7, Pos X

Byte 14 = face 8, Pos X

Byte 16 = face 1, Pos Y (Y position information is 2 bytes long)

Byte 18 = face 2, Pos Y

....

Byte 28 = face 7, Pos Y

Byte 30 = face 8, Pos Y

Byte 32 = face 1, size (Size information is 2 bytes long)

Byte 34 = face 2, size

....

Byte 44 = face 7, size

Byte 46 = face 8, size

Byte 48 = face 1, Angle (Angle information is 1 byte long)

Byte 49 = face 2, Angle

....

Byte 48 = face 7, Angle

Byte 55 = face 8, Angle

EX_WHITE_BALANCE

Extension Unit Control Number		0x11	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	10	Min	0
Default	0	Camera CMD	CM_CC_MODE

Selects the white balance mode as per the table below.

	Mode
0	Auto
1	Hold
2	ATW
3	Light bulb
4	Neutral colour fluorescent light
5	Clear sky
6	Cloudy sky
7,8	Setting prohibited
9	Daylight colour fluorescent
10	Light bulb colour fluorescent light

EX_CC_OFFSET

Extension Unit Control Number		0x12	
Get	No	Length	1
Set	Yes	Type	Unsigned Int
Max	1	Min	0
Default	0	Camera CMD	CM_CC_OFFSET

Colour correction, white balance, gain offset. 0 = off, 1 = on.

EX_CC_OFFSET_SETUP

Extension Unit Control Number		0x13	
Get	Yes	Length	2
Set	Yes	Type	Signed Ints
Max	127	Min	-128
Default	0	Camera CMD	

Sets the camera supplementary registers: CC_R_OFFSET and CC_B_OFFSET.
Also see EX_CC_OFFSET.
The values of each range from -128 to 127.

EX_CC_SPEED

Extension Unit Control Number		0x14	
Get	Yes	Length	1
Set	Yes	Type	Unsigned Int
Max	2	Min	0
Default	0	Camera CMD	CM_CC_SPEED

Sets the white balance convergence speed.
0=Normal
1=High Speed
2=Low Speed

EX_FW_REV

Extension Unit Control Number		0x15	
Get	Get	Length	8
Set	No	Type	Char Array
Max	255	Min	0
Default	NA	Camera CMD	

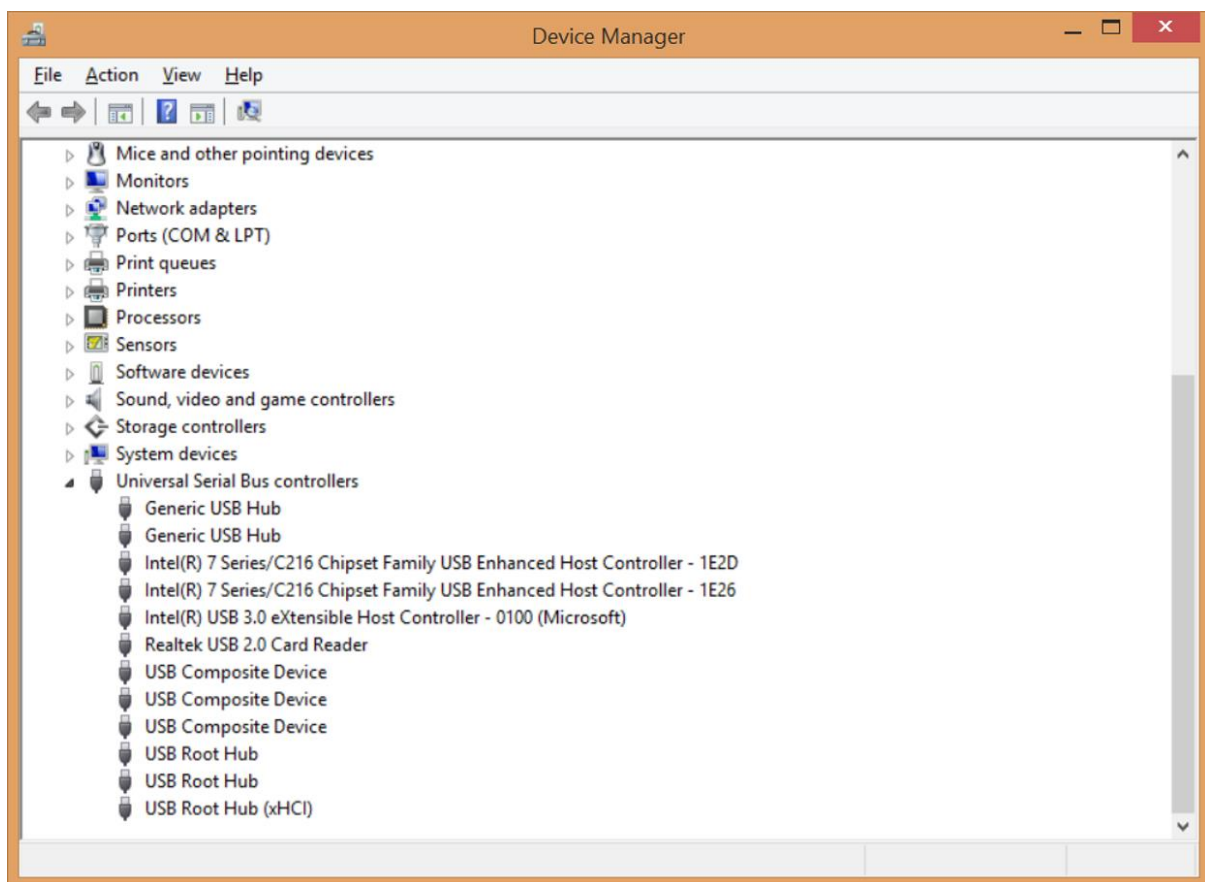
Returns the firmware revision number as an array of chars. There is no null character appended to the end.

APPENDIX 3 : TROUBLESHOOTING

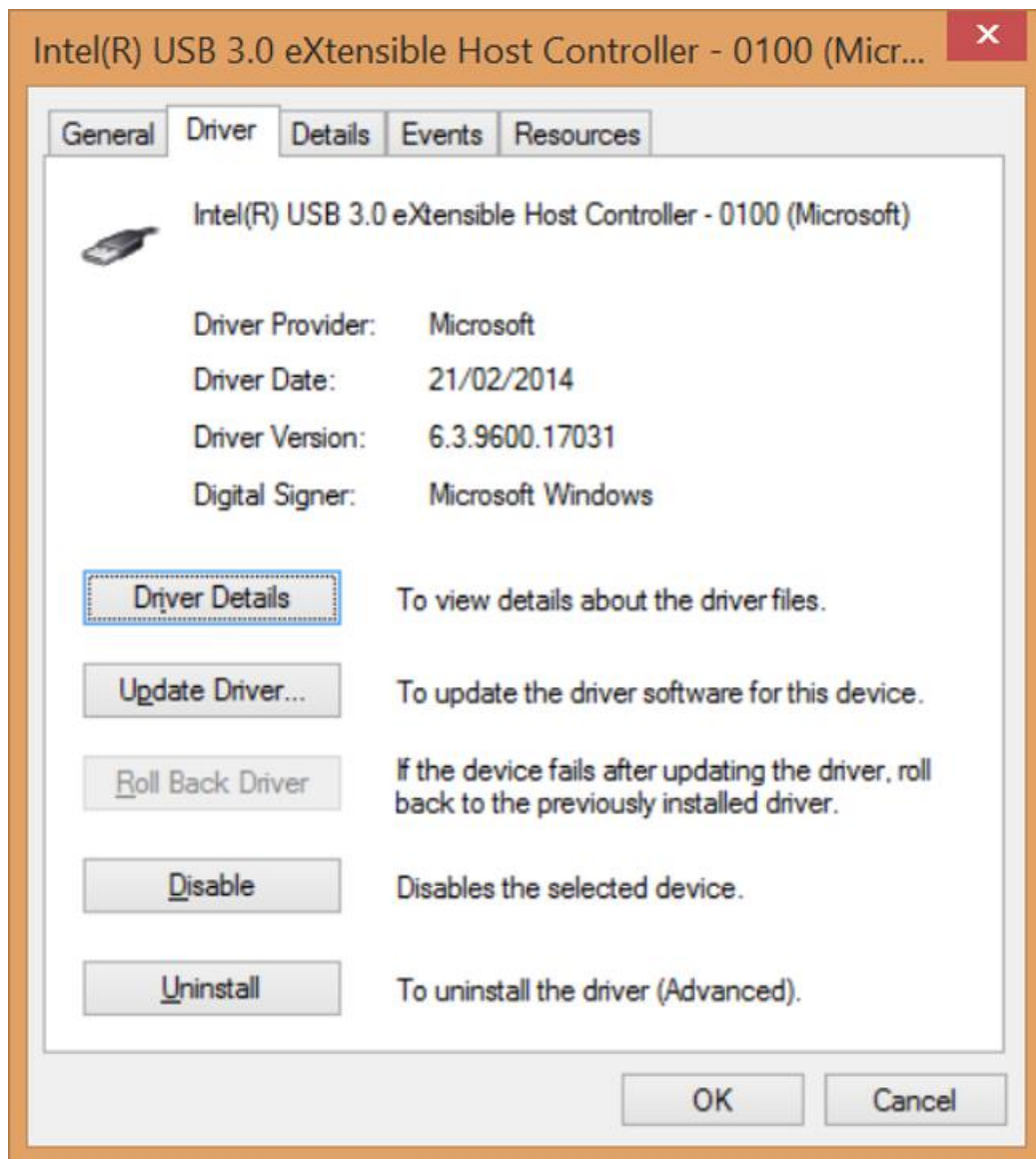
If you have trouble with the video image dropping out on a frequent basis you should ensure that the operating system is fully up to date. You should then make sure that the USB3.0 host controller is updated. In most cases this resolves the issue. However if not please check all connections, change FCC cable and USB3.0 cable.

Updating the Host Controller Driver

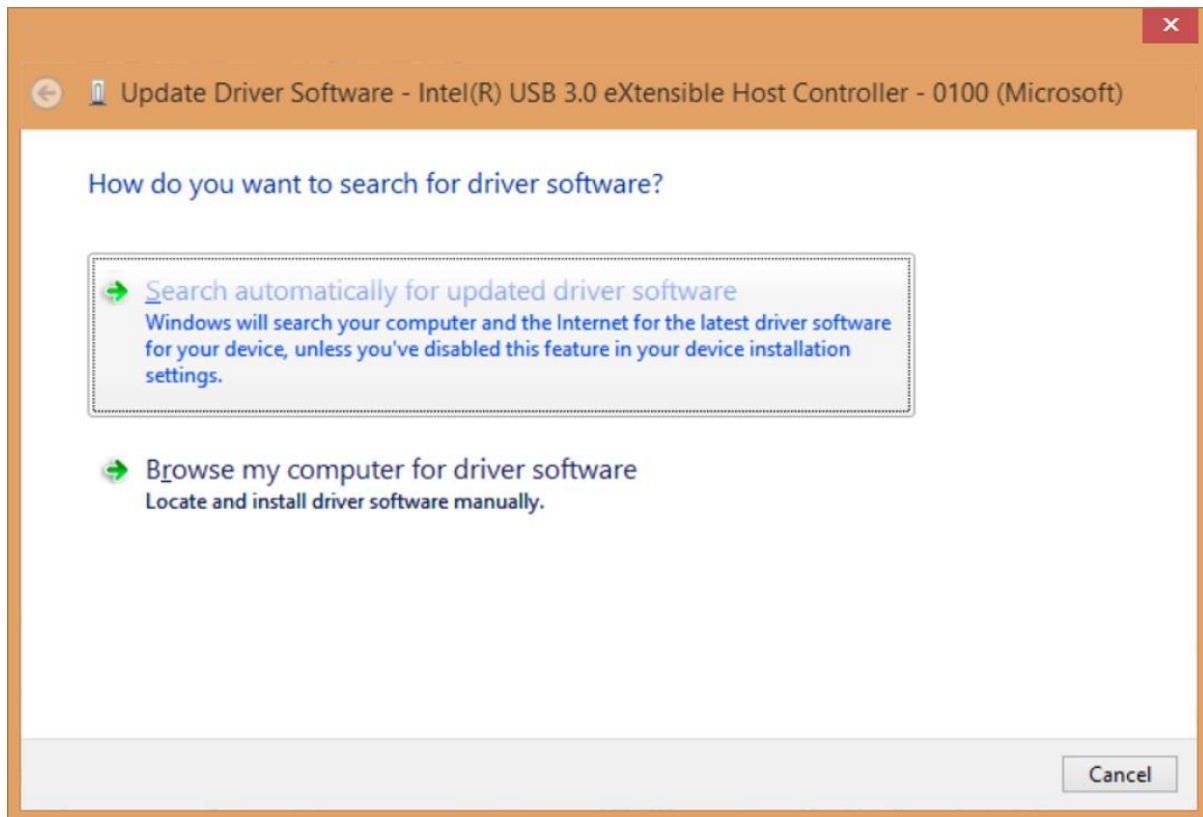
Via control panel open up the device manager and reveal the Universal Serial Bus controllers.



Locate and select the USB3.0 Host Controller and select the Driver tab :



Search for available drivers on the internet and install if a more up to date driver is found :



These issues can vary depending on the manufacturer of the host controller. If the problem still persists please search for known issues with the particular brand of host controller, on the internet.

If you cannot resolve the issues in this way and you have updated your operating system then please send a description of your issues to mark.vernon@vreo.biz.